

What Is Claimed Is:

1. An improved pharmaceutical container for containing a pharmaceutical agent which is heated, subjected to increased pressure or radioactive, comprising:

- a. an inlet arm,
- b. a hollow column, and
- c. an outlet arm,

wherein the improvement comprises configuring the outlet arm so that it does not protrude into the hollow portion of the column, and support means to support the inlet arm and the outlet arm.

2. The improved pharmaceutical container of claim 1, wherein the container is constructed of a material which is resistant to radiation.

3. The improved pharmaceutical container of claim 1 or 2, wherein the container is constructed of a radiation resistant polypropylene.

4. The improved pharmaceutical container of claim 1 or 2, wherein the container is constructed of PP 13R9A polypropylene.

5. An improved pharmaceutical container of claim 1 or 2, wherein a notch is provided in the hollow column at the point where the outflow arm intersects the hollow column.

6. The improved pharmaceutical container of claim 1 or 2, further comprising a basket receptacle area inside the column for receiving a basket where the inlet arm intersects the column, said basket receptacle area further comprising one or more notches, said notches configured to cooperate with one or more protrusions on a basket to be inserted into the basket receptacle area in such a way so as to insure that the basket is properly seated in the basket receptacle area.

7. The improved pharmaceutical container of claim 1 or 2, further comprising two stoppers which form tight seals with and prevent leakage from an open top end and an open

bottom end of the column, wherein said stoppers are made of a material which is resistant to radiation, optionally further comprising a packing material which optionally contains a pharmaceutical agent.

8. The improved pharmaceutical container of claim 7, wherein the bottom stopper takes up substantially all of the space at the open bottom end of the column, without blocking the outlet arm, so as to reduce the amount of the dead volume at the bottom of the column.

9. The improved pharmaceutical container of claim 7 or 8, wherein said stoppers are made of a material selected from the group consisting of isoprene/chlorobutyl, bromobutyl and FM 140/0.

10. The improved pharmaceutical container of claim 7 or 8, wherein said stoppers are made of isoprene/chlorobutyl.

11. The improved pharmaceutical container of claim 7 or 8, wherein each of said stoppers comprises a top cylindrical portion and a bottom cylindrical portion, said bottom cylindrical portion having a diameter sufficient to insure a tight seal between the stopper and the cylinder interface, and said top cylindrical portion having a diameter greater than the bottom cylindrical portion.

12. The improved pharmaceutical container of claim 11, wherein the bottom cylindrical portion contains a U-shaped channel at its base.

13. The improved pharmaceutical container of claim 12, wherein the top cylindrical portion has indicia disposed on its surface, said indicia disposed so that it indicates the direction of the open end of the U-shaped channel.

14. The improved pharmaceutical container of claim 8 or 12, further comprising a centrally located indentation at a top end of the stopper.

15. The improved pharmaceutical container of claim 8 or 12, wherein the stoppers are held in place by crimping a crimp seal around the stoppers to affix them to the container.

16. The improved pharmaceutical container of claim 15, wherein the crimping is performed with an automatic or semi-automatic crimper.

17. The improved pharmaceutical container of claim 15 or 16, wherein the automatic crimper is a pneumatic crimper.

18. The improved pharmaceutical container of claim 15 or 16, wherein the crimp seal is crimped at a pressure of about 60-140 psi.

19. The improved pharmaceutical container of claim 15 or 16, wherein the crimp seal is constructed of a material which is resistant to radiation.

20. The improved pharmaceutical container of claim 15 or 16, wherein the crimp seal is constructed of a material selected from the group consisting of aluminum, steel and tin.

21. The improved pharmaceutical container of claim 15 or 16, wherein the crimped stopper is able to withstand a pressure of between 90 psi and 200 psi inside the sealed container.

22. The improved pharmaceutical container of claim 15 or 16, wherein the crimp seal is made of aluminum and comprises a top crimp member and a bottom washer.

23. The improved pharmaceutical container of claim 15 or 16, wherein the crimp seal is made of steel and comprises a single crimp seal member.

24. The improved pharmaceutical container of claim 22, wherein the top crimp member comprises a generally circular surface with a central hole and a skirt, and the bottom washer comprises a generally circular surface with a central hole.

25. The improved pharmaceutical container of claim 23, wherein the crimp seal member comprises a generally circular surface with a central hole and a skirt.

26. The improved pharmaceutical container of claim 22 or 24, wherein the top crimp member further comprises an insert, said insert being seated in or under the central hole, and further wherein said insert contains a central hole whose diameter is less than the diameter of the central hole in the top crimp member.

27. The improved pharmaceutical container of claim 15 or 25, wherein said crimp seal comprises a single crimp seal member made of steel with a generally circular surface having a diameter of about $20.75 \text{ mm} \pm 0.25 \text{ mm}$ and a skirt with a height of about $7.00 \text{ mm} \pm 0.25 \text{ mm}$, and wherein said generally circular surface has a central hole with a diameter of about $5.00 \text{ mm} \pm 0.25 \text{ mm}$.

28. The improved pharmaceutical container of claim 15 or 25, further comprising a removable cover which covers the central hole in the top crimp member.

29. The improved pharmaceutical container of claim 1, for generating rubidium-82.

30. The improved pharmaceutical container of claim 1, further comprising a first connector tube which attaches to the inlet arm via a Luer lock, and a second connector tube which attaches to the outlet arm via a Luer lock, wherein a portion of each Luer lock is affixed to each of the connector tubes and another portion of the Luer locks is affixed to each of the inlet arm and outlet arm.

31. The improved pharmaceutical container of claim 30, wherein the connector tubes and the Luer lock portions attached to the connector tubes are made of materials which are resistant to radiation.

32. The improved pharmaceutical container of claim 30 or 31, wherein the connector tubes are made of a flexible, radiation resistant polyvinyl chloride and the Luer lock portions attached to the connector tubes are made of a rigid, radiation resistant polyvinyl chloride.

33. The improved pharmaceutical container of claim 30 or 31, wherein the connector tubes are made of PVC 2232 A/R-78S clear 030X and the Luer lock portions attached to the connector tubes are made of PVC 2212 RHT/1-118 clear 080X.

34. An improved Luer lock comprising a female Luer cap and a male Luer cap, wherein one of said Luer caps contains a flange and the other of said Luer caps contains threads, configured so that the flange and threads cooperate with each other in such a way that the female Luer cap and male Luer cap can be screwed together, wherein the improvement comprises providing for one or a plurality of tabs on each of the male and female Luer caps, wherein the tabs on the male Luer cap and the tabs on the female Luer cap achieve a desired configuration with respect to each other when the tightening of the two Luer caps together is complete.

35. The improved Luer lock of claim 34, wherein the male and female Luer caps each contain two tabs.

36. The improved Luer lock of claim 34 or 35, wherein the desired configuration is where the respective tabs on the male Luer cap and the female Luer cap line up with each other.

37. The improved Luer lock of claim 34 or 35, wherein the desired configuration is where the respective tabs on the male Luer cap and the female Luer cap overlap with each other, thus preventing overtightening or loosening of the Luer lock.

38. The improved pharmaceutical container of claim 1, which is shipped or packed in with an absorbent material.

39. The improved pharmaceutical container of claim 38, wherein the absorbent material is GP-100.

40. An improved rubiduum -82 generator comprising:

- a. a hollow column with a top portion, a middle portion and a bottom portion, said top portion including one or more notches, and a screen separating the middle portion and the bottom portion;
- b. a top basket with one or more protrusions, said one or more protrusions configured to cooperate with the one or more notches in the top portion of the hollow column so as to cause the proper seating of the top basket in the top portion of the hollow column, said top basket further comprising a screen at its base and a side opening;
- c. an inlet arm which intersects the hollow column at its top portion at a point where the inlet arm is aligned with the side opening in the top basket, and further wherein the inlet arm has a female Luer cap at its distal end, said female Luer cap containing one or more tabs on its outer surface;
- d. an outlet arm which intersects but does not protrude into the hollow column at its bottom portion, wherein a notch is provided at the point of intersection on the bottom portion's inner surface, and further wherein the outlet arm has a female Luer cap at its distal end, said female Luer cap containing one or more tabs on its outer surface;
- e. support means to support the inlet arm and the outlet arm to the hollow column

wherein said hollow column, top basket, inlet arm, outlet arm and support means are constructed of a radiation resistant polypropylene;

- f. a packing material comprising stannic oxide with strontium-82 adhered to it, said packing material placed in the middle portion of the hollow column above the bottom screen and below the screen of the top basket;
- g. a top stopper comprising a radiation resistant material, said top stopper configured to form a tight seal with the top portion of the hollow column but which does not block the inlet arm;
- h. a bottom stopper comprising a radiation resistant material, said bottom stopper configured to form a tight seal with the bottom portion of the hollow column and minimizing the dead space in the bottom portion of the hollow column, without blocking the outlet arm;
- i. first a crimp seal to crimp the top stopper to the top portion of the hollow column and a second crimp seal to crimp the bottom stopper to the bottom portion of the hollow column, wherein each crimp seal comprises steel with a thickness of about 0.2mm and a central hole about 5.0mm in diameter, wherein each crimp seal is crimped to a pressure of about 117 psi;
- j. a first flexible tube comprising a flexible, radiation resistant polyvinyl chloride with a first male Luer cap comprising a rigid, radiation resistant polyvinyl chloride at one end of said first flexible tube, said first male Luer cap being configured to cooperate with the female Luer cap at the distal end of the inlet arm so that the two Luer caps can be screwed together to form a tight Luer lock, and wherein said first male Luer cap contains one or more tabs on its outer surface which will align with the

one or more tabs on the outer surface of the female Luer cap at the distal end of the inlet arm, such that when the two Luer caps are screwed together these tabs achieve a desired configuration with respect to each other when the tightening of the Luer caps is complete; and

- k. a second flexible tube comprising a flexible, radiation resistant polyvinyl chloride with a second male Luer cap comprising a rigid, radiation resistant polyvinyl chloride at one end of said second flexible tube, said second male Luer cap being configured to cooperate with the female Luer cap at the distal end of the outlet arm so that the two of them can be screwed together to form a tight Luer lock, and wherein said second male Luer cap contains one or more tabs which will align with the one or more tabs on the female Luer cap at the distal end of the outlet arm, such that when the two Luer caps are screwed together these tabs achieve a desired configuration with respect to each other when the tightening of the Luer caps is complete.

41. An improved rubidium-82 generator comprising:

- a. a hollow column with a top portion, a middle portion and a bottom portion, said top portion including one or more notches, and a screen separating the middle portion and the bottom portion;
- b. a top basket with one or more protrusions, said one or more protrusions configured to cooperate with the one or more notches in the top portion of the hollow column so as to cause the proper seating of the top basket in

the top portion of the hollow column, said top basket further comprising a screen at its base and a side opening;

- c. an inlet arm which intersects the hollow column at its top portion at a point where the inlet arm is aligned with the side opening in the top basket, and further wherein the inlet arm has a female Luer cap at its distal end, said female Luer cap containing one or more tabs on its outer surface;
- d. an outlet arm which intersects but does not protrude into the hollow column at its bottom portion, wherein a notch is provided at the point of intersection on the bottom portion's inner surface, and further wherein the outlet arm has a female Luer cap at its distal end, said female Luer cap containing one or more tabs on its outer surface;
- e. support means to support the inlet arm and the outlet arm to the hollow column

wherein said hollow column, top basket, inlet arm, outlet arm and support means are constructed of a radiation resistant polypropylene;

- f. a packing material comprising stannic oxide with strontium-82 adhered to it, said packing material placed in the middle portion of the hollow column above the bottom screen and below the screen of the top basket;
- g. a top stopper comprising a radiation resistant material, said top stopper configured to form a tight seal with the top portion of the hollow column but which does not block the inlet arm;
- h. a bottom stopper comprising a radiation resistant material, said bottom stopper configured to form a tight seal with the bottom portion of the

hollow column and minimizing the dead space in the bottom portion of the hollow column, without blocking the outlet arm;

- i. first a crimp seal to crimp the top stopper to the top portion of the hollow column and a second crimp seal to crimp the bottom stopper to the bottom portion of the hollow column, wherein each crimp seal comprises steel with a thickness of about 0.2mm and a central hole about 5.0mm in diameter, wherein each crimp seal is crimped to a pressure of about 117 psi;
- j. a first flexible tube comprising a flexible, radiation resistant polyvinyl chloride with a first male Luer cap comprising a rigid, radiation resistant polyvinyl chloride at one end of said first flexible tube, said first male Luer cap being configured to cooperate with the female Luer cap at the distal end of the inlet arm so that the two Luer caps can be screwed together to form a tight Luer lock and where said first male Luer cap contains one or more tabs on its outer surface which will overlap with the one or more tabs on the outer surface of the female Luer cap at the distal end of the inlet arm, such that when the two Luer caps are screwed together these tabs overlap and are pushed past each other, and a tight Luer lock which is resistant to inadvertent loosening is formed; and
- k. a second flexible tube comprising a flexible, radiation resistant polyvinyl chloride with a second male Luer cap comprising a rigid, radiation resistant polyvinyl chloride at one end of said second flexible tube, said second male Luer cap being configured to cooperate with the female Luer

cap at the distal end of the outlet arm so that the two of them can be screwed together to form a tight Luer lock, and wherein said second male Luer cap contains one or more tabs which will overlap with the one or more tabs on the female Luer cap at the distal end of the outlet arm, such that when the two Luer caps are screwed together these tabs overlap and are pushed past each other, and a tight Luer lock which is resistant to inadvertent loosening is formed.

42. An improved rubidium-82 generator system comprising:
- a. a rubidium-82 generator surrounded by a generator shield;
 - b. a saline supply connected to an inlet arm of the rubidium-82 generator by one or more saline supply tubes connected to each other in series, said saline supply tubes being connected to each other and to the inlet arm of the rubidium-82, generator by connecting means;
 - c. one or more outflow tubes connected in series and connected to each other and to an outflow arm of the rubidium-82 generator via connecting means;
 - d. a divergence means at a terminal end of the outflow tubes, the divergence means being connected to a patient tube and a waste tube such that a liquid flowing through the divergence means can be diverted to the patient tube or the waste tube; and
 - e. a waste bottle surrounded by a waste bottle shield, wherein the waste bottle is connected to the waste tube via a connecting means;

wherein the improvements comprise:

- f. support means to support the inlet arm and the outlet arm of the rubidium-82 generator; and
- g. configuring the outlet arm so that it does not protrude into a hollow interior portion of the rubidium-82 generator.

43. The improved rubidium-82 generator of claim 42, further providing for one or more additional tubes connected to each other in series and connected between the divergence means and the patient tube by connecting means, to provide for a desired distance from the rubidium-82 generator to a patient.

44. The improved rubidium-82 generator of claims 42 or 43, wherein one or more of the connecting means is a luer connector.

45. The improved rubidium-82 generator of claim 44, wherein the luer connector comprises a female luer cap and a male luer cap, wherein one of said luer caps contains a flange and the other of said luer caps contains threads, configured so that the flange and threads cooperate with each other in such a way that the female luer cap and male luer cap can be screwed together, and further providing for one or a plurality of tabs on each of the male and female luer caps, wherein the tabs on the male luer cap and the tabs on the female luer cap achieve a desired configuration with respect to each other when the tightening of the two luer caps together is complete.

46. The improved rubidium-82 generator of claim 45, wherein the male and female luer caps each contain two tabs.

47. The improved rubidium-82 generator of claims 45 or 46, wherein the desired configuration is where the respective tabs on the male luer cap and the female luer cap line up with each other.

48. The improved rubidium-82 generator of claims 45 or 46, wherein the desired configuration is where the respective tabs on the male luer caps and the female luer cap overlap with each other, thus preventing over tightening or inadvertent loosening of the luer lock.

49. The improved rubidium-82 generator of claim 42 or 43, wherein the rubidium-82 generator, tubes, connecting means, divergence means and waste bottle are all constructed of radiation resistant materials.

50. The improved rubidium-82 generator of claim 42, wherein the patient tube terminates in a check valve to prevent air from entering the patient tube when the patient tube is disconnected from the patient.

51. The improved rubidium-82 generator of claim 50, wherein the check valve is constructed of radiation resistant materials.

52. The improved rubidium-82 generator of claim 50, wherein the patient tube includes a sterile filter and the check valve is attached before the sterile filter.

53. The improved rubidium-82 generator of claim 50, wherein the patient tube includes a sterile filter and the check valve is attached after the sterile filter.